

THURSDAY, APRIL 15, 1909.

POPULAR SCIENCE.

- (1) *Astronomy of To-Day. A Popular Introduction in Non-Technical Language.* By the late Dr. Cecil G. Dolmase. Pp. 362; illustrated. (London : Seeley and Co., Ltd., 1909.) Price 5s. net.
- (2) *Scientific Ideas of To-Day. Popularly Explained.* By Charles R. Gibson. Pp. 344; illustrated. (London : Seeley and Co., Ltd., 1909.) Price 5s. net.

(1) **W**HILST possessing a thorough knowledge of any science, it is often found to be a difficult matter to coordinate one's facts so that the novice shall be at once sufficiently interested and efficiently instructed; but the former of these two works demonstrates to us that the ideal is not unattainable; the late Dr. Dolmase succeeded in a task in which so many writers have failed.

By the arrangement of the various branches of the subject, the reader is ever led from coordinated generalities to the more specific details, and is always prepared for what he is reading by the knowledge acquired from the previous chapters. Thus, while the general features of the solar system are expounded in the third chapter, the various members of it are not discussed in fuller detail until chapters xii.-xviii., the reader meanwhile being prepared for this fuller treatment by carefully reasoned chapters on gravitation, celestial distances and magnitudes and their measurement, eclipses, the evolution of methods of observation, and spectrum analysis.

Occasionally it appears that the endeavour to employ only popular language has resulted in some ambiguity. Thus the term "thicker" is applied to the sun's successive layers when, as shown in the succeeding paragraph, "denser" was presumably intended; but such slips are few in number and, to the general reader, comparatively unimportant.

In describing the planets the author accepted the conventional terminology, but protested against the use of "inferior" and "superior" instead of the more generally descriptive terms "interior" and "exterior"; certainly for the general reader the latter terminology appears to be preferable.

The discussion of Martian features, and their imports, is a difficult one for any writer of the present day to tackle, but in this volume the reader is given a very clear and concise statement of the various theories and their corroborative observations.

The chapters which follow deal in the same popular—yet scientific—manner with comets, meteors, the stars and the universe, and an interesting volume is brought to a close by two chapters dealing respectively with the beginning and the ending of things, the latter containing a graphic, if terrifying, picture of the collision of a dark sun with the solar system.

The twenty-four illustrations and twenty diagrams have been carefully chosen and well reproduced, and, with the clear statements of the text, they should certainly open the eyes of the "general reader" to most of the wonders of the universe surrounding him.

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(2) Mr. Gibson's work, a companion volume of the "To-Day" series, is also intended for readers whose acquaintance with the latest concepts relating to the matter and motion around them is of the "general" order, and a great deal that has been said above concerning the good arrangement and clear statements of Dr. Dolmase's work may also be said of this volume.

The author's ideal is to explain in popular language how the matter around us is built up and how the energy affecting that matter is transformed, transmitted, and received. No previous knowledge of science or mathematics is assumed; all that the reader has to do is to take the subjects in the order in which they are discussed; he will then find that no serious difficulties occur because his previous reading has prepared him for what follows.

A marked feature of this book is the number of analogies by which the various actions and interactions are illustrated. These are selected from everyday life, and are always apt and illuminating, so that totally new ideas concerning, say, the construction of the atom, the nature of electricity, the causes of radio-activity, and like subjects are always clothed in a familiar garb.

The subjects dealt with are too diverse to treat *seriatim* in a brief notice, but they may be classified under the headings matter and its construction, the nature, measurement, and perception of various forms of radiation, energy and its transmission, gravity, the *aether*, and the origin of life. We are thus introduced to the latest ideas concerning electrons, the dissociation and association of atoms, radio-activity, spectrum analysis, action at a distance, and the origin of life and matter. In every branch the author remembers that he is endeavouring to reach minds previously ignorant of such matters, and is, therefore, very careful in his selection and definition of terms. Thus, for example, in order to avoid any possible ambiguity, he prefers "electrons" to "corpuscles," and employs "*aether*" instead of the "*ether*" now so often used, and in these and similar cases he discusses the reasons for doing so.

Four appendices give further information on various subjects, and should prove very useful in supplementing the necessarily brief explanations in the book itself. The first of these gives the ingredients of the world, *i.e.* the elements, their atomic weights, and the order, with dates, of their discovery. That these lists have been carefully prepared is illustrated by the fact that, in the last, helium is mentioned twice; discovered in the sun, by Lockyer, in 1868, and on the earth, by Ramsay, in 1895. Appendix ii. outlines the history of the modern theory of light, iii. gives particulars of *aether* waves, and iv. describes, more fully, the methods by which invisible electrons are counted and measured.

The forty illustrations are admirable; instead of the old-fashioned diagrams, with which he has been regaled so often, the general reader will find here reproductions of actual photographs, either of working apparatus showing just how the experiments are performed, or illustrating clearly the results obtained.

These, with the concise and illuminating descriptions in the text, should give any reader of ordinary intelligence a very fair idea of the marvellous discoveries of modern science regarding the things and movements around him.

WILLIAM E. ROLSTON.

RARE ELEMENTS.

Introduction to the Rarer Elements. By Dr. Phillip E. Browning. Second edition, thoroughly revised. Pp. x+207. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1908.) Price 6s. 6d. net.

DURING the last few years our knowledge of the chemistry and properties of the rarer elements has been largely developed, and the scientific and commercial interests connected with them having assumed considerable importance, the publication of a second edition of the above useful handbook is to be welcomed.

The scheme of the work remains the same as in the edition of 1903; with each element an account is given of its discovery, occurrence, extraction, properties, &c., concluding with more or less voluminous details of experimental research work. The revision has been very thorough; some matter dealing with supposed elementary substances, the existence of which has since proved more than doubtful, has been removed—for example, the so-called elements etherion, lucium, glaukodymium, &c. A chapter on radio-elements by Dr. B. B. Boltwood is included, and the section on rare earths has been largely increased, and much valuable matter added to it.

The description of niobium and tantalum has been brought up to date, and all that is known of the latter interesting and very valuable metal, with its chemistry and unique properties, is given. The gases of the atmosphere, argon, helium, krypton, neon, and xenon, with their history and properties, are described in detail, and several pages are devoted to an account of some of the technical applications of the rarer elements which greatly emphasises the importance of research among these practically unknown substances; the book concludes with a series of tables for the qualitative separation of the rarer elements.

Speaking generally, as might be expected from the repute and position of the author, the work is thoroughly practical and trustworthy, and is confined to a brief description of known facts, the author having wisely refrained almost completely from touching upon the huge mass of speculative matter that has unhappily been woven into this branch of chemistry; no mention is made of the alleged transmutation of copper into lithium by radium emanation, and no surmises are given of the results that may be expected to follow the production of so many pounds of radium, &c.; in fact, the brevity is carried to an extent that is almost to be regretted, but what is given is to the point. The chapter on the radio-active elements commences with a brief account of the discovery of radio-activity by M. Henri Becquerel, and of radium by P. and S. Curie and G. Bemont, with the properties of uranium, ionium, actinium, thorium, &c.,

and the section concludes with a table of radio-activities giving the "radiation emitted," "disintegration constant," and "half-value time period" for all the known radio-elements.

Much valuable matter has been added to the section on rare earths; a list is given of more than 170 rare-earth minerals, with the composition, percentage of yttria, ceria, thoria, and zirconia, so far as is known in each case; and in the portion dealing with the chemistry, a diagrammatic scheme for their separation is shown; this diagram is a novelty, and will be found a distinct help in elementary work on rare earths, but considering the obscurity that undoubtedly still surrounds the reactions of many of these bodies it can only be taken as suggestive.

It is much to be regretted that little or nothing is said about the spectra of these obscure bodies, particularly as it is by the study of their spectra that most of them have been recognised and isolated; the extremely characteristic spark spectra of yttrium, samarium, europium, ytterbium, scandium, and other elements are passed over without notice; when we take as only one instance the fact that the very rare element scandium can be directly detected in minerals containing it by a single observation, this is the more remarkable.

We may give as an instance of the present activity of research among the rare earths the fact that since this edition went to press the announcement has been made by G. Urbain and by Auer von Welsbach of the decomposition of ytterbium into two distinct substances.

It is a very great pity that the work has not been properly indexed; brevity in this direction is a decided disadvantage, and takes much from the usefulness of the work.

J. H. G.

A GENERAL HISTORY OF SCIENCE.

Aus der Werkstatt grosser Forscher. Allgemein-verständliche erläuterte Abschnitte aus den Werken hervorragender Naturforscher aller Völker und Zeiten. By Dr. Friedrich Dannemann. Dritte Auflage. Pp. xii+430. (Leipzig: W. Engelmann, 1908.) Price 6 marks.

D. DANNEMANN'S book represents an attempt to trace the gradual growth of scientific knowledge by a superficial examination of critical epochs in which some new discovery has been made available or some truth apparent. It seems a very desirable, as it is a very pleasant, task to survey the whole history of natural science, to recall the men whose genius and achievements have widened the outlook, and given force and direction to new researches. Such a study may be pleasantly impressive and momentarily stimulating, but while it lacks in thoroughness and precision its educational value must be small. A student of a particular department of science should know, it is true, the successive stages by which that subject has advanced, and the author is quite justified in intimating that the study of the original memoirs in which the great masters have developed their results, in the language in which they have expressed themselves, is eminently calculated to present the